

Materials
Testing
Consultants, INC.

**REPORT OF
WASTE DISTRIBUTION STUDY
WESTERN WAYNE COUNTY CORRECTIONAL FACILITY
PLYMOUTH, MICHIGAN**

Prepared For:

Michigan Department of Management and Budget

Prepared By:

**MATERIALS TESTING CONSULTANTS, INC.
Grand Rapids, Michigan**

August 2005
MTC Project No. 021355

TABLE OF CONTENTS

| Title | Page |
|--|-----------|
| 1.0 EXECUTIVE SUMMARY | 1 |
| 2.0 INTRODUCTION | 2 |
| 3.0 WASTE DISTRIBUTION STUDY | 6 |
| 3.1 Purpose | 6 |
| 3.2 Methodology | 7 |
| 3.3 Results | 8 |
| 3.3.1 Site Topography | 8 |
| 3.3.2 Distribution of Waste Materials | 8 |
| 4.0 EVALUATION OF REMEDIAL ALTERNATIVES | 10 |
| 4.1 Alternative No. 1: Unrestricted Generic Residential Closure - Excavation | 12 |
| 4.2 Alternative No. 2: Waste Consolidation and Construction of One 15 Acre Engineered Cap | 14 |
| 4.3 Alternative No. 3: Waste Consolidation and Construction of Two 10 Acre Engineered Caps | 18 |
| 4.4 Alternative No. 4: Restrictive Closure using Engineering Controls And Deed Restrictions | 20 |
| 5.0 REVIEW OF ALTERNATIVES | 23 |
| 5.1 Performance | 24 |
| 5.2 Implementability | 24 |
| 5.3 Reliability | 25 |
| 5.4 Safety | 26 |
| 5.5 Relative Cost | 27 |
| 5.6 Residual Liability | 29 |
| 5.7 Environmental | 29 |
| 6.0 RANKING OF ALTERNATIVES | 30 |

LIST OF FIGURES

| | |
|-----------------|--------------------------------------|
| Figure 1 | Site Location Map |
| Figure 2 | Test Pit Locations |
| Figure 3 | Topographical Map |
| Figure 4 | Three Dimensional Contour Map |
| Figure 5 | Waste Thickness Contour Map |

Materials Testing and Observations (cont'd)

Title

LIST OF TABLES

| | |
|---------|------------------------------------|
| Table 1 | Conceptual Costs Alternative No. 1 |
| Table 2 | Conceptual Costs Alternative No. 2 |
| Table 3 | Conceptual Costs Alternative No. 3 |
| Table 4 | Conceptual Costs Alternative No. 4 |
| Table 5 | Summary of Conceptual Costs |
| Table 6 | Ranking of Alternatives |

APPENDICES

| | |
|---|---------------------------|
| A | Test Pit Logs |
| B | Wetland Delineation Study |
| C | Limitations |

1.0 EXECUTIVE SUMMARY

The Western Wayne County Correctional Facility (WWCCF) consists of an approximately 127.29-acre parcel located in the Northwest 1/4 of Section 20, Town 1 South, Range 8 East, Plymouth Township, Wayne County, Michigan (Figure 1). The State of Michigan operated the site as a correctional facility since purchasing the property from the City of Detroit in 1985.

Previous studies documented the presence of waste materials on a substantial percentage of the WWCCF property. The waste materials were deposited on the property when it was operated as an open dump during the 1920s through the 1950s. In April 2004, Materials Testing Consultants, Inc. (MTC) completed a risk assessment for the secure prison area to evaluate potential exposure risks to prison inmates, workers, visitors, contractors and the general public. The risk assessment concluded that based on the information available, an unacceptable exposure risk was not present in the prison area or to the general public. The prison was closed at the end of 2004.

In June 2005, a Waste Distribution Study was completed to map the presence of waste across the WWCCF property for the purpose of evaluating potential remedial alternatives and providing conceptual cost estimates necessary to evaluate future property use. The waste distribution study included 67 test pits completed across the WWCCF property (Figure 2). The test pits were used to record the waste thickness at each location. The results were mapped and the waste volume calculated at approximately 700,000-cubic yards. Waste volume and distribution were used to review potential remedial alternatives, which included complete waste removal and residential closure, two waste consolidation and capping alternatives and construction of a contact barrier over the current waste areas with restricted closure.

Each alternative was reviewed based on relative performance, implementability, reliability, safety, relative cost, residual liability and environmental effectiveness. Based on the preliminary review of alternatives, from a cost and effectiveness standpoint, the preferred alternative appears

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 2

to be consolidation of all waste materials into a 15-acre solid waste management unit on the western portion of the property (Alternative No. 2). The conceptual cost of the preferred alternative is approximately \$4,100,000 and would require approximately 5 to 7 years for construction. The conceptual cost does not include backfilling of the waste removal areas and would re-establish former wetlands that were previously filled by waste. Additional costs would be associated with the abatement of hazardous materials and demolition of the structures that formerly comprised the prison. The also review concluded that additional studies are needed including a site-specific risk assessment for the entire property.

Due to the potential quantities of cover material and backfill involved with the proposed alternatives, it may be possible to negotiate substantially lower costs for excavation, hauling and disposal. A determination of whether adequate quantities of cover materials are available on the WWCCF site coupled with the decision to backfill or grade existing materials will also greatly affect the final cost of remediation. Unit costs were based on previous projects in the general area of the WWCCF site. The conceptual costs are intended to represent relative levels of effort for each alternative.

2.0 INTRODUCTION

The WWCCF is located in the Northwest 1/4 of Section 20, Town 1 South, Range 8 East, Plymouth Township, Wayne County, Michigan. The WWCCF is commonly referred to as 48401 5-Mile Road, Plymouth, Michigan and includes approximately 127.29-acres.

In September 2002, MTC conducted a limited assessment of environmental soil quality on the proposed location of the Michigan Department of Corrections (MDOC) gun range on the

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 3

WWCCF property (located approximately 1,500-feet west of the secure prison area). The area of proposed gun range was known to contain waste deposited when the property was operated as a dump from the 1920s through the 1950s. In 2002, fill was deposited on the western area of the property on top of the dump for future construction of the gun range. MTC completed soil sampling to evaluate both the dump and fill materials. Based on the analytical results, the area considered for construction of the gun range at WWCCF met the definition of a "*Facility*" under the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended. The MDOC was concerned that exposure risks could also be present within the prison area. Sampling was proposed to evaluate potential risks.

Subsequent studies focused on evaluating potential health-based risks associated with operation of the correctional facility. In January 2003, MTC completed a Limited Environmental Site Assessment (LESA) for the area outside of the secure prison. The LESA included a reconnaissance visit to the WWCCF site, a review of the site history, a limited review of adjacent properties, a review of selected local, state and federal regulatory records, interviews with persons and agencies familiar with the property, and preparation of a Draft Report. The draft LESA report concluded that an open dump occupied approximately 75-percent of the WWCCF site, and according to interview information, extended beneath the secure prison area.

In February 2003, MTC conducted a Preliminary Assessment (PA) of exposure risks at WWCCF. The PA included sampling and laboratory analyses of shallow soils, surface water and sediment, ambient air sampling for particulate lead, and methane gas. Additional site characterization was completed in August 2003 and February 2004. Phase II site characterization included the installation of twelve monitoring wells, ten dedicated gas probes, collection and analysis of a second round of ambient air samples and the installation of 118

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 4

shallow soil borings within the prison area. A geophysical survey was also completed across the entire 127.29-acre property to map electromagnetic anomalies. Laboratory analyses were conducted on air samples, water samples and soil samples to evaluate potential health risks to prison employees, inmates and nearby residents. Hydrogeologic studies were completed to evaluate migration of contaminants in groundwater.

During the course of the ongoing studies, the MDOC implemented interim measures to prevent exposures to surface soil and evaluate gaseous emissions. The interim measures were designed to limit the exposure pathway for human dermal contact to site soils and to monitor for methane within all buildings at WWCCF. The measures included instructing staff to refrain from contacting site soils, to supply raised garden beds for all horticultural activities, and to install methane detectors in all structures. In addition, all future subsurface work was subcontracted to qualified contractors with the necessary training under the Hazardous Waste Operations and Emergency Response Act (29 CFR 1910.120).

Chemical data obtained from site characterization activities at WWCCF were compared to Generic Residential Cleanup Criteria (GRCC) established by the Michigan Department of Environmental Quality (MDEQ). Lead and arsenic concentrations exceeded the GRCC protective of human direct contact in gun range area soils. Lead concentrations in gun range soils also represented a potential inhalation hazard, but the migration pathway was not confirmed by two air-monitoring events within the prison area. Methane gas was detected in several gas probes at concentrations exceeding the lower explosive limit. Continued monitoring in prison buildings did not confirm the presence of methane. Policies were implemented to address methane awareness and monitoring. The only potential health-based risk identified in the prison area was human dermal contact exposure to arsenic concentrations in surface soil that exceeds

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 5

the MDEQ GRCC. The GRCC are protective of the identified receptor populations, however, a site-specific criterion was considered more appropriate. A risk assessment was completed to assess the analytical data and evaluate potential health-based risks at WWCCF.

The risk assessment was prepared based on the former use scenario of a secure prison area and did not address other areas of the property or future property use. A conceptual model was prepared outlining exposure pathways and potential receptor populations including prison inmates, prison employees, prison visitors, prison subcontractors, and nearby residents. The Statewide Default Background Levels (SDBLs) and GRCC were used to screen analytical data. The risk screening process removed all potential health-based risks except direct contact exposure to arsenic in soils within the prison area. A strong argument was presented that soil arsenic concentrations were naturally occurring; however, information obtained from the MDOC was used to calculate a site-specific arsenic direct contact criterion.

Calculation of the site-specific criterion indicated that potential health-based risks associated with prison inmate/employee exposure to soil arsenic concentrations was insignificant based on the exposure model, and did not represent an unacceptable health-based risk. The risk assessment concluded that an unacceptable health-based risk was not identified in the secure prison area; however, a potential fugitive dust exposure pathway was present in the gun range area. Additional particulate monitoring was recommended until vegetative stabilization of surface soils was completed in the gun range area. Dust control measures are still considered essential if any earth-moving activity is conducted in the gun range. A deed restriction prohibiting the installation of a water supply well was also recommended to permanently eliminate the drinking water pathway on WWCCF property.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 6

The risk assessment concluded that additional site characterization was necessary to evaluate human health and ecological risks associated with non-secure areas of the WWCCF site. Additional information regarding the chemical nature and volume of waste located on the property was necessary to review remedial alternatives for the WWCCF property for closure to residential, commercial and/or industrial criteria.

Non-secure areas of the property contain exposed waste materials, which represent potential chemical and slip-fall hazards. Trespassers may be subject to chemical and physical hazards. MTC recommended installation of a perimeter fence to secure the site with warning signs placed at a frequency that is clearly visible to anyone who may enter the property. MTC also recommended the completion of a risk assessment for non-secure areas of the WWCCF site.

3.0 WASTE DISTRIBUTION STUDY

3.1 Purpose

The purpose of the waste distribution study was to map the extent and thickness of waste materials across the WWCCF property and calculate waste volumes. The information would then be used to prepare a review of remedial alternatives and conceptual closure costs.

3.2 Methodology

An excavation contractor was selected through a competitive bid process. Test pits were completed the week of June 6, 2005 using a track-mounted excavator. Test pit locations were targeted at anomalies identified in the Geophysical Investigation, previous soil borings, and areas believed to be absent of waste. Test pits were extended through waste materials into natural soils and the waste thickness measured and recorded at each location. A log was prepared for each test pit identifying materials encountered and the thickness of waste materials, if any (Appendix A).

A ground survey was completed by a licensed surveyor in order to locate the position and elevation of each test pit. A topographical survey was completed by Abrams Aerial Survey Corporation. The ground and aerial surveys were combined to produce contour maps depicting ground elevations with 1-foot contour intervals and waste thickness maps. Contouring was completed using SURFER[®] version 8.0. Waste thicknesses at each test pit location were used to produce a waste thickness contour map. In some instances, a relatively thin layer of soil was present above the waste materials. At these locations, the waste thickness was assumed to extend from the ground surface to the bottom of the waste. The waste contour map was used to calculate waste volumes by approximating the area of waste and multiplying by the contoured depth. Calculations were produced by SURFER[®] and independently verified by hand.

3.3 Results

3.3.1 Site Topography

The topographical map produced from the aerial survey is included as Figure 3. A three-dimensional contour map of the ground surface is included as Figure 4. Approximately 50-feet of elevational relief is present on the WWCCF site. The elevational high occurs near the northeast corner of the property (approximately 885-feet) and slopes to the south and west. The area occupied by the secure prison area is generally flat (855 to 860 feet). Elevational lows occur in several wetland areas located near the western portion of the property (approximately 835-feet). Ground elevations increase to approximately 845-feet near the western boundary in the former farm area. Additional information on wetlands is contained in the wetland delineation study (Appendix B).

3.3.2 Distribution of Waste Materials

Test pit locations are indicated in Figure 2. Waste thickness contours are provided as Figure 5. Waste materials are primarily distributed in three areas. MTC has identified the three areas as Area 1 (western portion of property), Area 2 (northeastern portion of property) and Area 3 (southeastern portion of property). Scattered debris, appliances, metal, and other waste materials occur outside these areas, however, the primary waste mass and volume is located within the designated areas. No noticeable difference in waste materials was observed in the three areas. Each area is described below:

Area 1

Area 1 is located within a former wetland complex near the western 1/3 of the property. The area is approximately 12-acres in size and contains approximately 335,000 cubic yards (503,000 tons) of waste materials. The average waste thickness was calculated at 17.5-feet. The maximum waste thickness recorded in this area was 20.5-feet at Test Pit No. 14. This area also includes the formerly proposed gun range and approximately 55,000 cubic yards of soil previously hauled onto the property for the contemplated construction of a MDOC gun range. The gun range soil was described in previous reports as containing elevated levels of metals due to stockpiling and working the soil within the waste area. The estimated waste volume for Area 1 does not include the referenced gun range soil volume.

The margins of Area 1 include regulated wetland areas A, B, C, D and I, as described in the Wetland Delineation Report completed by JFNew (May 20, 2005). The JFNew report is included as Appendix B. Wetland areas are shown in Figure 5. Construction work in this area would likely require a permit under the Natural Resources and Environmental Protection Act (P.A. 451 of 1994, Part 303, Wetland Protection). Impact to these wetlands would require mitigation at a minimum of 1.5 times the impacted wetland area.

Area 2

Area 2 is located near the northeastern portion of the property and includes the southern ½ of the visitor parking lot and the extreme northeast corner of the secure prison area. The area is approximately 6-acres in size and contains approximately 140,000-cubic yards (210,000-tons) of waste material with an average waste thickness of 14.5-feet. The maximum waste thickness recorded in this area was 18-feet at Test Pit No. 22. Area 2 also incorporates waste materials encountered to the southeast as identified at Test Pit Nos. 25, 28 and 62.

Area 3

Area 3 is located near the southeast corner of the property. The area is approximately 19-acres in size and contains approximately 225,000-cubic yards (337,500-tons) of waste material. The maximum waste thickness recorded in this area was 13.5-feet at Test Pit No. 38. Waste materials in Area 3 appear to be thinner (average waste thickness of 7.5-feet) and more widespread than in Areas 1 and/or 2. Area 3 also incorporates waste materials encountered to the northeast as identified at Test Pit Nos. 31 and 54.

4.0 EVALUATION OF REMEDIAL ALTERNATIVES

MTC used the results of the Waste Distribution Study and previous investigations to evaluate four potential remedial alternatives.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 11

- Residential Closure including the removal of all waste materials
- Consolidation of the three waste areas and construction of a single impermeable cap located in Area 1
- Consolidation and construction of an impermeable cap over Area 1 with consolidation of Areas 2 & 3 and construction of a second cap in Area 3
- Establishing engineering and institutional controls, as necessary, to eliminate exposure hazards under a restrictive closure

The evaluation includes conceptual cost estimates and time frames for site closure with each alternative in accordance with closure requirements set forth under Part 201 of P.A. 451, as amended. The conceptual costs and time frames are provided for decisions regarding the future use of the property and do not represent a proposal or guarantee by MTC. The estimated costs do not include building demolition or the abatement of hazardous building materials (asbestos, lead paint, etc.). As recommended in the LESA and prison area risk assessment, additional studies will be necessary prior to final design and preparation of a Remedial Action Plan (RAP). Preparation of specifications and receipt of bids by qualified contractors will also be necessary to provide accurate cost estimates. MTC believes that the conceptualized costs are conservative. Due to the potential quantities of cover material and backfill involved with the proposed alternatives, substantially lower costs may be negotiated for excavation, hauling and disposal. A determination of whether adequate quantities of cover materials are available on the WWCCF site coupled with the decision to backfill or grade existing materials will greatly affect the final cost of remediation. Unit costs were based on previous projects in the general area of the WWCCF site. The conceptual costs represent relative levels of effort for each alternative. To maximize the return on investment, remedial costs should be considered with respect to future property values associated with the completion of each alternative.

4.1 Alternative No. 1: Unrestricted Generic Residential Closure - Excavation

Excavation and disposal of all contaminated soil exceeding MDEQ Generic Residential cleanup criteria was the most costly alternative evaluated. Alternative No. 1 would provide unrestricted closure with no institutional controls, land use restrictions or restrictive covenants attached to the property. Alternative No. 1 would reduce liability associated with the property and allow unlimited residential or other uses. Estimated time required for completion is approximately 36-48 months.

Alternative No. 1 would require the completion of a detailed RAP that outlines tasks necessary for the removal of waste materials, verification sampling and final residential closure. The primary field tasks would include securing the work area by installation of a perimeter fence, clearing and grubbing of vegetation and excavation, transport and disposal of waste materials to a licensed disposal facility. Following removal of all waste materials, verification soil sampling would be necessary to confirm residential closure. A Closure Report would be prepared following the conclusion of verification sampling.

Based on the results of the waste distribution study, MTC estimates that excavation of 700,000 cubic yards (1.05 million tons) of waste material (Areas 1 through 3) and contaminated soil would be necessary to meet Part 201 Generic Residential criteria. Purchase and placement of approximately 700,000 cubic yards of clean backfill would be required to re-establish existing grades. The cost estimate was prepared based on the assumption that backfill would not be

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 13

required. Waste removal without backfill would re-establish the former wetland complexes previously filled with waste material. Re-establishment of wetlands would decrease the acreage of developable property. The decision to backfill should be based upon the cost to backfill versus property value.

Soil sampling and analyses for verification of soil remediation would require collection and analyses of a minimum of 160 verification soil samples. Additional samples may be necessary if constituents were detected above cleanup criteria in any of the samples or if a statistical evaluation indicated more samples were needed. A wetland permit may be required prior to initiating any remediation activities. Approximate costs associated with Alternative No. 1 are summarized in Table 1.

Table 1
Conceptual Costs
Alternative No. 1

Unrestricted Generic Residential Closure - Excavation

| | |
|---|---------------------|
| RAP | \$7,000 |
| Specifications, Bid Documents, Procurement | \$8,000 |
| Security Fencing (10,000-feet) | \$250,000 |
| Grubbing and clearing (36-acres) | \$108,000 |
| Excavation (1,050,000-Tons) | \$1,400,000 |
| Transport and Disposal (1,050,000-Tons) | \$15,750,000 |
| Laboratory (verification sampling) | \$75,000 |
| Site Restoration including wetland mitigation | \$200,000 |
| Consulting, Documentation and Reporting | \$150,000 |
| Subtotal: | \$17,948,000 |
| 15% Contingency | \$2,692,200 |
| TOTAL: | \$20,640,200 |

*purchase, deliver and place 700,000 cubic yards of backfill add \$9,030,000

4.2 Alternative No. 2: Waste Consolidation and Construction of One 15 Acre Engineered Cap

Alternative No. 2 includes consolidating all waste materials in one area and constructing an engineered cap over the waste to provide for protection of human health and the environment from exposure to waste materials (solid waste and leachate), as well as, surface soil, perched surface water/sediment and potential exposures to groundwater. The area selected for construction of the cap is Area 1. Area 1 is the best possible choice for the following reasons:

- Area 1 currently contains the greatest volume of solid waste, minimizing consolidation activities
- Area 1 is located in an elevationally low area minimizing the elevation of the final cap therefore reducing erosion and leachate migration potential

Under Alternative No. 2, solid waste would be excavated from Areas 2 and 3 and transported to Area 1. Waste present along the margins of Area 1 would be consolidated to the smallest practical area. The engineered cap would be consistent with the Solid Waste Management Act, Part 115 of the Natural Resources and Environmental Protection Act 451, P.A. 1994, as amended. A final cover design consistent with Rule R299.4425(3) of Part 115 would include:

- 1) An infiltration layer composed of a minimum of 2-feet of earthen material with a hydraulic conductivity less than or equal to 1.0×10^{-7} cm/sec;
- 2) An erosion layer that consists of a minimum of 0.5-feet of earthen material

capable of sustaining plant growth; and

- 3) An MDEQ-approved alternate cover design equivalent to the above

A RAP would be prepared outlining all activities necessary for the proposed remedy. Additional studies may be required prior to completion of the RAP. These studies may include a site-specific risk assessment and landfill feasibility study.

A site-specific risk assessment was prepared by MTC for the secure prison area in April 2004. A second risk assessment would be prepared for the area outside the secure prison area. The risk assessment would evaluate potential exposure pathways as necessary to ensure that completion of the RAP eliminates all unacceptable risks to human health and the environment.

A landfill feasibility study would address logistical issues associated with construction of the cap (leachate management systems, landfill gas venting, surface water management, control of fugitive dust during construction and appropriate site-specific cleanup criteria). The landfill feasibility study may also include an evaluation of potential recreational uses (soccer fields, driving ranges, etc.) compatible with the remedy. Final determination of appropriate recreational uses would be dependent upon post construction landfill conditions including the following:

- Potential settlement and its affects on the integrity of the cover
- Landfill gas concentrations in ambient air

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 16

- Gas pressures within the waste material
- The availability of MDEQ proposed recreational land use criteria (not currently available)
- Zoning requirements
- Public approval
- Other factors identified at the time of construction

Several permits would be required for construction. These permits may include, but are not limited to a Part 91 Soil Erosion and Sedimentation Control Permit and a Part 303 Wetland Permit including a mitigation plan, if necessary.

Construction of the cap would cover approximately 15-acres and increase ground elevations in the capped area by approximately 22-feet. Preliminary studies would include an evaluation of clay source materials that may be available on the WWCCF site and surrounding area. Identifying a nearby source of clay would reduce construction costs and truck traffic on township roads. Based on the availability of suitable clay material, the landfill feasibility study may conclude that an alternate cover design is preferred that incorporates a geocomposite clay membrane or other liner configuration.

Prior to construction, a perimeter fence should be installed to discourage trespassers and prevent accidental exposures. Waste consolidation and cap areas would require clearing of vegetation to facilitate waste removal and verification sampling. After construction of the cover, the cap area would be seeded and

mulched to establish a vegetative layer necessary for stabilization and erosion control.

Following consolidation and/or construction, any areas not meeting unrestricted residential closure may require restrictive covenants to reduce the potential for unacceptable exposures. For example, the area of the cap would require a restrictive covenant to ensure proper maintenance of the cover, prevent activities that interfere with the remedial action, operation or monitoring tasks, prevent unacceptable exposures (excavation, installation of water wells, etc.), prohibit the construction of structures without prior approval by MDEQ, restrict conveyance of the property without prior notice, and to provide right of entry to MDEQ personnel to allow monitoring of compliance with the approved RAP. Permanent markers would be posted identifying the restricted areas of the site and the nature of the restrictions.

Financial assurance mechanisms would be necessary for long-term maintenance and monitoring of the effectiveness of the cap. Deed restrictions and/or local ordinances may be needed to ensure the integrity of the cap over time. A groundwater monitoring system would be required if the risk assessment does not eliminate all migration pathways to groundwater and/or surface water. Long-term monitoring would also be required to ensure the effectiveness of the remedy. A summary of conceptual costs is provided in Table 2. Actual costs would be dependent on the results of future studies, contractor bids, and logistical issues that cannot be determined with certainty at this time. We estimate that the time to complete Alternative No. 2 would be approximately 5 to 7-years.

Materials Testing Consultants, INC.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 18

Table 2
Conceptual Costs
Alternative No. 2

Waste Consolidation and Construction of One 15-acre Engineered Cap

| | |
|---|--------------------|
| Landfill Feasibility Study | \$10,000 |
| Risk Assessment and RAP | \$15,000 |
| Design Specification and Bid Procurement | \$15,000 |
| Security Fencing | \$250,000 |
| Grubbing & Clearing | \$108,000 |
| Consolidate 140,000 cubic yards from Area 2 | \$700,000 |
| Consolidate 225,000 cubic yards from Area 3 | \$1,125,000 |
| Construct 15-acre Cap in Area 1 | \$900,000 |
| Groundwater Monitoring Network | \$100,000 |
| Verification Sampling in Areas 2 and 3 | \$40,000 |
| Consulting and Reporting | \$150,000 |
| Long-Term Monitoring, Maintenance and Repair (10-years) | \$125,000 |
| Wetland mitigation | \$25,000 |
| Filing of Notices | \$10,000 |
| Subtotal: | \$3,573,000 |
| 15% Contingency | \$535,950 |
| TOTAL: | \$4,108,950 |

*purchase, deliver and place 365,000 cubic yards of backfill add \$4,709,000

4.3 Alternative No. 3: Waste Consolidation and Construction of Two 10 Acre Engineered Caps

Design and construction of two engineered caps was reviewed to perform a cost benefit analysis between cap construction and waste consolidation. Alternative No. 3 evaluates consolidation and construction of a 10-acre cap over Area 1 and consolidation of waste from Area 2 to Area 3 with construction of a second 10-acre cap at that location. Preliminary studies and cap construction details outlined

in the discussion for Alternative No. 2 (including preparation of a risk assessment, landfill feasibility study, RAP, specifications and bid documents, required permits and restrictive covenants) also apply to Alternative No. 3. Discussion regarding these items is not repeated in this section.

The conceptual costs associated with Alternative No. 3 are presented in Table 3. Construction of two separate caps significantly reduces waste consolidation volume and increases cap construction costs and long-term maintenance and monitoring costs. The projected cost for Alternative No. 3 is only slightly higher than Alternative No. 2.

State of Michigan Department of Management and Budget
 Western Wayne County Correctional Facility
 Project No. 021355
 August 1, 2005
 Page No. 20

**Table 3
 Conceptual Costs
 Alternative No. 3**

Waste Consolidation and Construction of Two Engineered Caps

| | |
|---|--------------------|
| Landfill Feasibility Study | \$10,000 |
| Risk Assessment and RAP | \$15,000 |
| Design Specifications and Bid Procurement | \$15,000 |
| Security Fencing | \$250,000 |
| Grubbing & Clearing | \$108,000 |
| Consolidate 84,700 cubic yards within Area #1 | \$424,000 |
| Consolidate 140,000 cubic yards from Waste Area #2 to Area #3 | \$700,000 |
| Consolidate 108,900 cubic yards within Waste Area #3 | \$544,500 |
| Construct 10 Acre Cap in Area #1 | \$600,000 |
| Construct 10-acre Cap in Area #3 | \$600,000 |
| Groundwater Monitoring Network | \$125,000 |
| Verification Sampling in Areas #1, #2 and #3 | \$30,000 |
| Consulting and Reporting | \$150,000 |
| Long-Term Monitoring, Maintenance and Repair (10-years) | \$250,000 |
| Wetland mitigation | \$25,000 |
| Filing of Notices | \$10,000 |
| Subtotal: | \$3,856,500 |
| 15% Contingency | \$578,475 |
| TOTAL: | \$4,434,975 |

*purchase, deliver and place 140,000 cubic yards of backfill (Area 2) add \$1,806,000

4.4 Alternative No. 4: Restrictive Closure using Engineering Controls and Deed Restrictions

The use of engineering and administrative controls would allow waste materials to remain in place on the property and prevent exposure by placing barriers and imposing permanent restrictions on property use. Liability for the existing contamination would remain the responsibility of the current owner, however,

future development could occur provided that the controls are determined to be effective and maintained in accordance with the "Due Care" requirements of Section 7a(1) , Section 20126(1)(c) of 1994 PA 451, as amended and the Part 9 Rules.

A thorough understanding of the contaminant migration pathways would be needed prior to implementation of Alternative No. 4. Limited Phase II ESA sampling and a site-specific risk assessment were completed for the secure prison area in April 2004, which indicated the presence of groundwater contamination and potential offsite migration of contaminants. The most likely contaminant receptors were identified as surface waters. Surface water and sediment sampling from the county drain exiting the WWCCF property indicated low concentrations of contaminants that may have originated from the WWCCF site. A small number of water wells were also identified at potential receptors.

Prior to proposing Alternative No. 4, it would be necessary to complete a risk assessment that clearly demonstrates that migration of contaminants is not occurring beyond the proposed restricted area. Potential migration of contaminated groundwater would be further evaluated by the addition of additional monitoring wells. A monitoring network and monitoring plan would be established for long-term monitoring of the effectiveness of the restrictive closure. A demonstration of groundwater not in an aquifer may be presented in lieu of a monitoring plan if the data meets all requirements. Storm sewer /drain tracking would be conducted to evaluate if runoff from waste areas is captured by storm drains.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 22

The engineered control included in Alternative No. 4 consists of a soil cover or cap. The cap would be constructed of an engineered fill capable of providing a physical barrier preventing exposure to chemical agents. The cap may be composed of compacted gravel, or engineered to provide an impermeable barrier (clay) if the risk assessment indicates that contaminants are leaching to groundwater or surface water. For purposes of our review, we have assumed that the cap will consist of a 0.5-foot impermeable clay barrier constructed across the entire 36-acres where waste materials were identified by the Waste Distribution Study. Consolidation of waste from outlying areas is anticipated during construction.

Administrative controls including a restrictive covenant or local ordinance would be emplaced and recorded with the appropriate agencies. At a minimum, these controls would include a security fence with signage identifying the property as contaminated property, a legal description of the restricted land, property use restrictions filed with the MDEQ and Plymouth Township including proper maintenance of the barrier, banning removal of the fence and/or signs, banning future onsite excavation or installation of water wells, and providing public notice of potential exposure dangers. A financial assurance mechanism would be established that is adequate to maintain security fencing and signage and to perform groundwater monitoring, as needed in perpetuity. Wetland and soil erosion and sedimentation control permits would be required prior to initiating remediation activities. The conceptual costs associated with Alternative No. 4 are summarized in Table 4.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 23

**Table 4
Conceptual Costs
Alternative No. 4**

Restricted Closure using Engineering Controls and Deed Restrictions

| | |
|--|---------------------|
| Feasibility Study | \$10,000 |
| Risk Assessment and RAP | \$15,000 |
| Design Specifications & Bid Procurement | \$15,000 |
| Security Fencing | \$250,000 |
| Site Survey for Legal Descriptions | \$10,000 |
| Grubbing and Clearing | \$108,000 |
| Consulting and Reporting | \$150,000 |
| Waste Consolidation (assume 100,000 yards) | \$750,000 |
| Purchase, deliver and place 36-acre, 0.5-foot engineered barrier (1,176,120 tons) | \$10,114,632 |
| Groundwater monitoring network | \$250,000 |
| Long-term monitoring maintenance and repair (10-years) | \$75,000 |
| Filing of Notices | \$10,000 |
| Subtotal: | \$11,757,632 |
| 15% Contingency | <u>1,763,645</u> |
| TOTAL: | \$13,521,276 |

5.0 REVIEW OF ALTERNATIVES

A preliminary review of four remedial alternatives was completed. In summary, the alternatives included the following:

- Alternative No. 1: Unrestricted Generic Residential Closure – Excavation
- Alternative No. 2: Waste Consolidation and Construction of One 15-Acre Engineered Cap

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 24

- Alternative No. 3: Waste Consolidation and Construction of Two 10-Acre Engineered Caps
- Alternative No. 4: Restrictive Closure using Engineering Controls and Deed Restrictions

Each alternative was reviewed based on relative performance, implementability, reliability, safety, relative cost, residual liability and environmental effectiveness.

5.1 Performance

The anticipated performance of Alternative Nos. 1 through 3 is considered similar since these alternatives include transport of waste materials to an engineered containment system. In all three alternatives, the integrity of the engineered structure will be maintained with monitoring requirements.

The anticipated performance of Alternative No. 4 is significantly lower due to the closure of waste material in place, which would have a higher potential for migration of leachate to groundwater and/or surface water. In addition, the large size of the cover and potential for development increases the potential for breaches and exacerbation of conditions.

5.2 Implementability

The implementability was evaluated based on constructability and time requirements. Alternative No. 4 is favored from a constructability standpoint because it requires no

waste consolidation or construction of solid waste management units. Placement of cover materials would require approximately 2-years.

Alternative No. 1 consists of excavation and transport of waste materials followed by grading and/or backfill. No structures would be required. The primary constructability concern would involve increased traffic on local roads (approximately 35,000 truck loads). Several landfill disposal options would be available. We would anticipate that the project could be completed in approximately 5-years.

The implementability of Alternative Nos. 2 and 3 is somewhat dependent upon the availability of cover source material. Difficulties may also arise due to localized areas of a high water table. Alternative No. 2 is favored over Alternative No. 3 due to the construction of one engineered cap versus two for Alternative No. 3. Construction of the solid waste management units and subsequent waste consolidation would require approximately 5 to 7-years.

5.3 Reliability

The anticipated reliability of Alternative Nos. 1 through 3 is considered similar since all these alternatives result in the transport of waste materials to an engineered containment system with impermeable liner. In all three alternatives, the operation and maintenance of the engineered structures are similar. Alternative No. 3 is considered less reliable due to the construction of two separate solid waste management units.

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 26

The anticipated reliability of Alternative No. 4 is significantly lower than the other alternatives due to closure of waste material in place, which has a higher potential for uncontrolled migration of leachate to groundwater and/or surface water. In addition, the large size of the cover and potential for development increases the potential for breaches and exacerbation of conditions. For this reason, completion of a risk assessment may conclude that Alternative No. 4 is not protective of human health and the environment, eliminating the alternative from consideration.

5.4 Safety

Final closure of the WWCCF site will result in the protection of human health and the environment based on future property use and criteria established by the U.S. Environmental Protection Agency and MDEQ. If the selected alternative and site use meet the assumptions inherent in the cleanup criteria algorithms (generic or site-specific) and assuming due care requirements are maintained, post remediation safety risks would be similar for each alternative. Safety concerns during construction differ slightly between the alternatives.

Alternative No. 1 will increase truck traffic on local roads significantly for a period of approximately 2-years. Based on a 20-cubic yard/truck average capacity, approximately 35,000 trips will be necessary for disposal. The increased traffic will result in an increased risk of injury due to traffic accidents to workers and the general public. The traffic risk associated with Alternative Nos. 2 through 4 is dependent on soil cover source material location. Additional studies are needed to evaluate material sources.

Risks associated with exposure to surface soil via contact, ingestion and/or inhalation of contaminated air, soil, groundwater, surface water, fugitive dust and landfill gases during construction are assumed to be proportional to the volume of waste disturbance for each alternative. Based on this assumption, the relative exposure risk would be greatest for Alternative No. 1 followed by Alternative Nos. 2, 3 and 4, respectively. Completion of the risk assessment and landfill feasibility study would be needed to better understand and quantify these risks.

5.5 Relative Cost

The conceptual costs of each alternative are summarized in Table 5. Actual costs are dependent upon the completion of additional studies, final design and bid procurement. The primary variables associated with the total cost of each alternative is whether excavated areas would be backfilled and the source (cost) of any backfill material. In addition to the backfill cost, three of the four alternatives require placement of a final cover or cap. As with backfill, the source of the cover material also exerts a major influence on the projected total cost. In order to provide conservative projections, MTC has included costs for delivery of cover material in our conceptual costs. Given the size of the property, it is possible that all backfill/cover material may be derived on site. We have included conceptual line item costs so that adjustments may be made by the reader. Approximate costs for relocating native materials would be similar to the conceptual waste consolidation costs of \$5/ton (cubic yard = 1.5 tons).

The relative construction costs indicate that Alternative No. 1, excavation and offsite disposal of all waste materials was the most costly of the reviewed alternatives followed

State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 28

by Alternative No. 4 (Restrictive Closure using engineering and Deed Restrictions). Alternatives Nos. 2 and 3 were similar in cost and significantly less than Alternative Nos. 1 and 4.

Table 5
Summary of Conceptual Costs

| Alternative No. | Conceptualized Costs |
|------------------------|-----------------------------|
| 1 | \$20,640,200 |
| 2 | \$4,108,950 |
| 3 | \$4,434,975 |
| 4 | \$13,521,276 |

To properly evaluate net costs, the post remediation property values must be considered. MTC is not aware of future development plans for the WWCCF site, however, implementation of Alternative No. 1 would result in unrestricted property use and the highest post-remediation property value. Detailed analysis using local residential/commercial/industrial real estate values would be necessary to evaluate development plans and select the remedial alternative that maximizes resale value. We anticipate that Alternative Nos. 2 and 3 would each provide over 100-acres of unrestricted property use and result in cumulative property values approaching Alternative No.1. Alternative No. 4 would result in restricted use for at least 36-acres of the property resulting in the lowest net resale value. If Alternative No. 4 is selected, Brownfield financing may be available to future developers.

5.6 Residual Liability

Alternative No. 1 (excavation and unrestrictive closure) would eliminate the liability and due care obligations for the WWCCF property and eliminate the potential for future migration of contaminants off the property. Liability would exist at the disposal facility receiving the waste should any future claim be brought against former customers. This liability is considered small.

Alternative Nos. 2 and 3 involve waste consolidation and construction of an impermeable cap. Closure would be obtained for areas of the site where waste was removed eliminating environmental liability in those areas. Liability would remain for the capped areas; however, the total liability would be concentrated on a controlled area. Long-term maintenance and monitoring would be included in the due care obligations.

Alternative No. 4 would result in significant liability over a 36-acre area. Due care obligations would be maintained for the property in perpetuity. Development of the capped area would be possible, however, geotechnical issues and due care obligations would significantly increase development costs.

5.7 Environmental

A thorough understanding of contaminant migration and exposure pathways would be possible following completion of the risk assessment for the unsecured area of the WWCCF property. Data collected during the LESA indicated the potential for offsite migration via groundwater, surface water and fugitive dust. Disturbance of the site

during construction would increase the risk of completing exposure pathways. The environmental risk during construction is tentatively based on the area of waste disturbance. Based on this assumption, relative exposure risks are greatest for Alternative No. 1 (disturbance of all solid waste) followed by Alternative No. 3 (approximately 365,000 cubic yards), No. 2 (333,600 cubic yards) and No. 4 (minor disturbance), respectively. Completion of the risk assessment and landfill feasibility study are needed to better understand and quantify these risks.

Post construction environmental risk is dependent upon the volume of waste remaining on the WWCCF site and the operation and maintenance of the solid waste management unit(s). Based on this approach, we assigned the post remediation environmental risk to be greatest for Alternative No. 4 (36-acre capped area), followed by Alternative No. 3 (20-acre), Alternative No. 2 (15-acre) and the least environmental risk with respect to the WWCCF property assigned to Alternative No. 1 (complete removal of solid waste).

6.0 RANKING OF ALTERNATIVES

The relative ranks of the evaluation criteria area are summarized in Table 6. The rankings are recorded from 1 to 4 with 1 being the most favorable ranking. The average ranking is a simple arithmetic mean. Further development of the alternatives may provide information used to develop a weighted mean based on the importance of each criterion. This may be completed following completion of the risk assessment and landfill feasibility study.

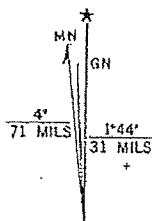
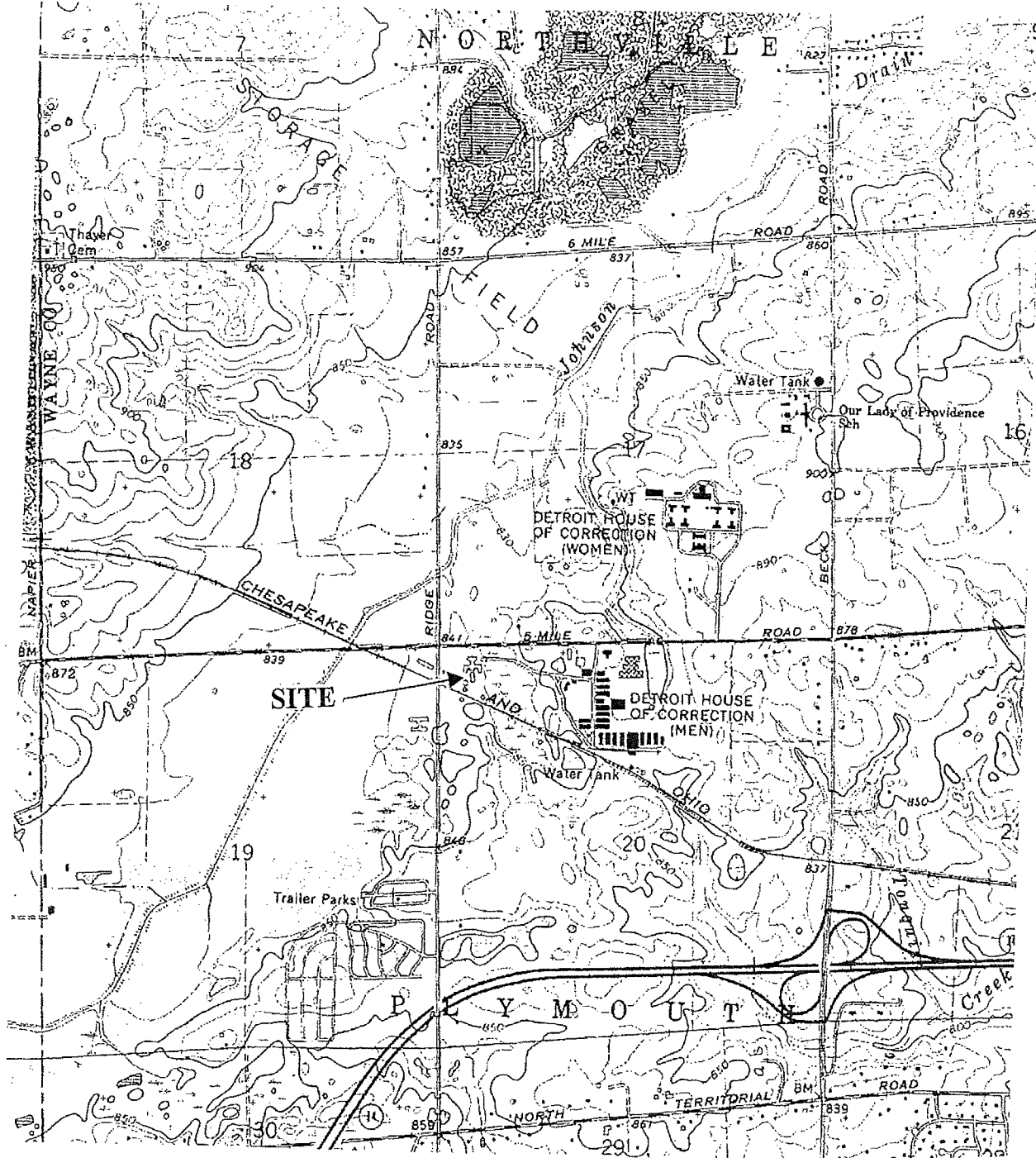
State of Michigan Department of Management and Budget
Western Wayne County Correctional Facility
Project No. 021355
August 1, 2005
Page No. 31

Table 6

Ranking of Alternatives

| Rank | Alternative No. 1 | Alternative No. 2 | Alternative No. 3 | Alternative No. 4 |
|---------------------|-------------------|-------------------|-------------------|-------------------|
| Performance | 1 | 2 | 3 | 4 |
| Implementability | 2 | 3 | 4 | 1 |
| Reliability | 1 | 2 | 3 | 4 |
| Safety | 1 | 2 | 3 | 4 |
| Relative Cost | 4 | 2 | 3 | 1 |
| Residual Liability | 1 | 2 | 3 | 4 |
| Environmental | 4 | 2 | 3 | 1 |
| Average Rank | 2.0 | 2.14 | 3.14 | 2.71 |

Based on a simple ranking, Alternative No. 1 is selected as the most favorable due to high rankings in performance, reliability, safety, and residual liability. Alternative No. 2 is ranked second with a conceptual cost that is approximately 25-percent of Alternative No. 1. The cost discrepancy is believed to be sufficient to tentatively select Alternative No. 2 as the preferred alternative. Completion of the risk assessment, landfill feasibility study, future development plans, and consideration of local property values will be necessary before final selection of a remedial alternative and preparation of a RAP. This report was prepared based on the limitations outlined in Appendix C.



UTM GRID AND 1980 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SALEM, MICH.
42083-D5-TF-024

1969
PHOTOREVISED 1973 AND 1980
DMA 4268 I NE-SERIES V862

| | | | |
|----------------------|--------------|--------------------|---|
| TITLE: Site Location | | | PROJECT: Western Wayne County Correctional Facility |
| SCALE: 1"=2000' | DATE: 8/2/05 | PROJECT NO. 021355 | Materials Testing Consultants, INC. |
| FIG. NO.: 1 | DR. BY: JTM | REV. BY: SKY | 693 PLYMOUTH N.E., GRAND RAPIDS, MICH. 49505 • PHONE 616-456-5469 |